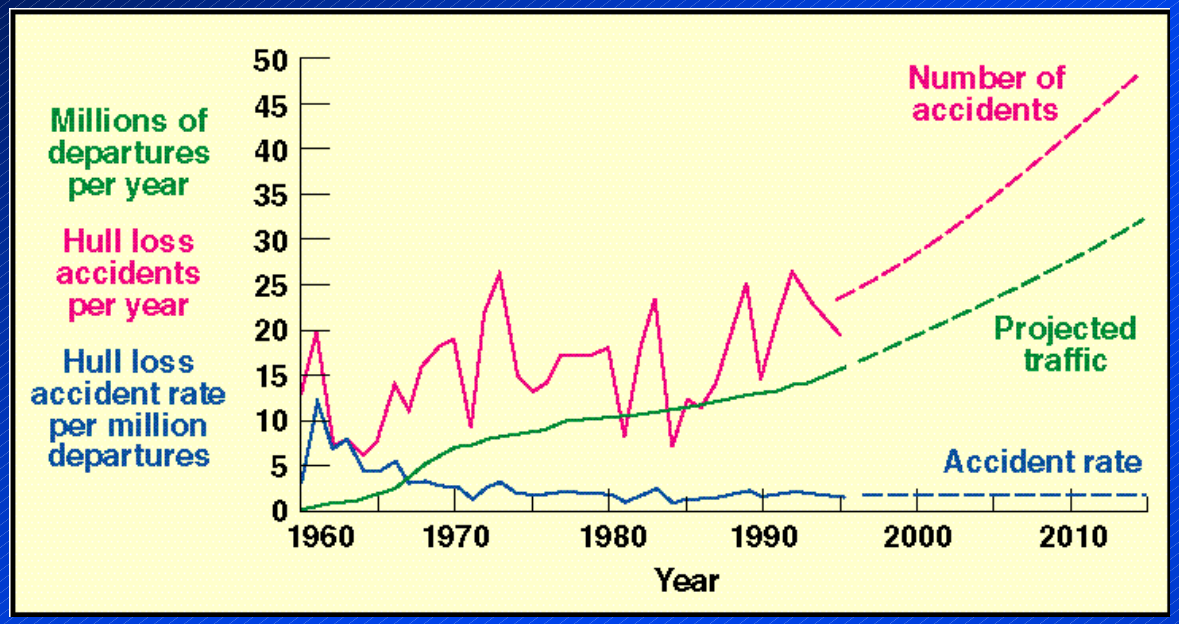
The Aviation Capacity and Safety Challenge

Air Traffic to Triple in Next 20 Years



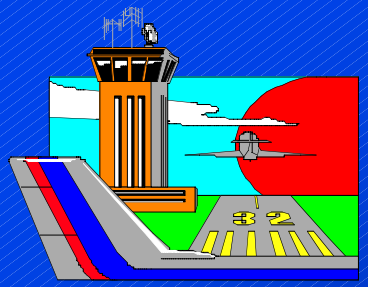
NASA Technology Goals

- **While maintaining safety, triple the aviation system throughput, in all weather conditions, within 10 years**
- **Reduce the aircraft accident rate by a factor of five within 10 years, and by a factor of ten within 20 years**

"The current air traffic management system is near its capacity limits with extensive system delays and inefficiencies resulting in annual losses to users estimated at over $3.5B."

Contributions to "Pillars for Success"

Global Civil Aviation



Air Traffic expected to triple in next 20 years

Aeronautics Technology Goals

- **Reduce the aircraft accident rate by a factor of five within 10 years, and by a factor of ten within 20 years**
- **Reduce emissions of future aircraft by a factor of three within 10 years, and a factor of five within 20 years**
- **Reduce the perceived noise levels of future aircraft by a factor of two from today's subsonic aircraft within 10 years, and by a factor of four within 20 years**
- **While maintaining safety, triple the aviation system throughput, in all weather conditions, within 10 years**
- **Reduce the cost of air travel by 25% within 10 years and by 50% within 20 years**

Safety Program Elements

- **Aviation Safety Program**
- **Base R&T (AOS, IT…)**

ASC Program Elements

- **Short-Haul Civil Tilt-Rotor (SHCT)**
- **Terminal Area Productivity (TAP)**
- **Advanced Air Transportation Technologies (AATT)**

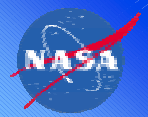
Emerging Requirements in Aviation

Free Flight / Air Traffic Management:

- Distributed Air-Ground Traffic Management (DAG-TM) Concepts
- Free Maneuvering / Conflict detection & resolution (ADS-B)
- User preferred trajectories; real-time NAS status information

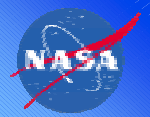
Weather Hazard Avoidance:

- Timely, consistent, graphical weather information to all users for enhanced situational awareness/safety
- Improved weather information for optimal maneuvering, traffic flow and fleet management around dynamic weather constraints
- Extended Electronic Pilot Reporting (EPIREPS) for improved nowcasting/forecasting

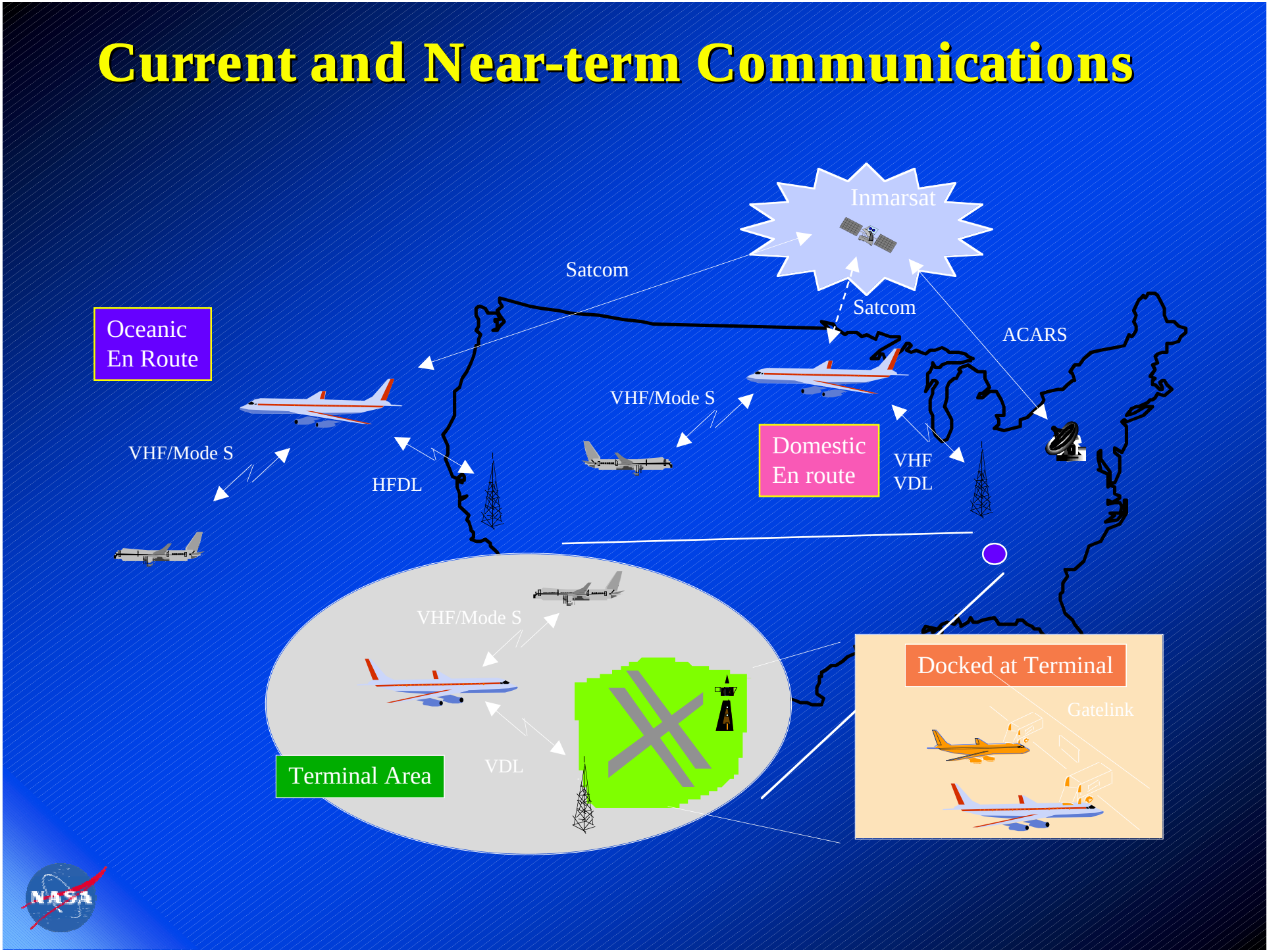


Communications Subsystem Elements

- Analog Voice
- ACARS
- VHF Datalink (VDL Modes 2-4, Broadcast)
- HFDL
- UAT
- SatCom (AMSS, NGSS, SDARS)
- Mode S
- Gatelink



Current and Near-term Communications



Next-Generation Datalink Communications

System Issues

Utilization
- Civil Transport
- General Aviation
- Military

Service Provider
- FAA
- Other Government
- Public / Private Commercial

Avionics Issues
- Equipage / Avionics Cost
- Applicability Across Platforms
- Mandatory/Primary/Optional
- Architecture - OSA / Proprietary
- Level of Integration

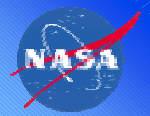
Link Characteristics
- Spectrum / Frequency
- Bandwidth
- Modulation
- Access Technique

Quality-of-Service
- Timeliness/Latency
- Priority
- Availability
- Redundancy
- Robustness

Delivery
- Voice/Data
- Simplex/Duplex
- Broadcast
- Line-of-sight
- Over-the-Horizon

Phase-of-Flight
- Planning
- Surface Movement
- Terminal Operations
- En Route / Oceanic

Coverage
- Global
- Regional
- Oceanic
- Line-of-Sight



ASC/AATT Management Structure

Level I

Aviation System Capacity Program Office
NASA Ames
Robert Jacobsen (Acting), Director

FAA Interagency Integrated Product Team

Air Traffic Management Executive Steering Committee

Level II

Advanced Air Transportation Technologies Lead Center
NASA Ames Research Center
Phil Snyder, Manager (Acting)
Michael R. Landis, Deputy Chief

Level III

NASA Ames Research Center

- ATM Concept Definition
  - *Adv Comm for ATM (GRC)*
- Benefits & Safety Assessment
- Human Factors
- Terminal/Surface Systems & Operations
- En Route Systems &Operations

NASA Langley Research Center

- Aircraft Systems and Operations

Aviation Safety Program Structure